INFORMATION REPORT INFORMATION REPORT

CENTRAL INTELLIGENCE AGENCY

S-E-C-R-E-T

25X1

COUNTRY USSR

REPORT

SUBJECT Spectroscopic Work in the USSR :

DATE DISTR. 5 November 1958

NO. PAGES 3

REFERENCES

25X1

DATE OF INFO.

PLACE & DATE ACQ.

25X1

SOURCE EVALUATIONS ARE DEFINITIVE. APPRAISAL OF CONTENT IS TENTATIVE.

1. There are three main centers of spectroscopic work in the USSR. In order of their importance they are:

   a. Leningrad. The State Optical Institute is the center for production of spectroscopic apparatus. Two prominent spectroscopists working in Leningrad are Professor S. E. Frish and Professor A. N. Zaydel'.

   b. Moscow, because of the school of spectroscopists headed by Sergey Leonidovich Mandel'shtam. A second very important figure in the Moscow school is A. K. Rusanov of the Institute of Applied Mineralogy.[1]

   c. Alma Ata, the Physical-Technical Academy of the Kazakh SSR.[2] Its most prominent spectroscopists are S. K. Kalinin, A. A. Yavorel', A. L. Alekseyeva, and L. E. Naymark. The last has published a spectral atlas which is considered a standard work in the USSR.[3]

2. Spectroscopic activities in the USSR include the following:

   a. Spectral analysis of gases, under Frish at Leningrad.

   b. Work with rare earths, done by Zaydel at Leningrad. He was under contract as long ago as 1950 to the Soviet Ministry of Internal Affairs for atomic energy research and was especially successful in applying spectroscopic analytical techniques for the Soviet atomic energy program. He is personally responsible for developing a method for removal of impurities through vaporization of the impure substances and depositing them on a carrier, which is later used as an electrode. The method can be applied only to viscous elements, since lighter elements boil away.

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(Note: Washington distribution indicated by "X"; Field distribution by "#".)

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c. Advanced work is being done by Mandel'shtam in short time radio impulses, through the use of which he avoids opposing influences of the individual complements. This work is recognized in the West as of considerable importance and is being followed by experiments of Western scientists 25X1

d. Spectral analysis as applied to minerals and ores; Rusanov is particularly active in this field. The area is of special importance to the USSR because of its vast mineral resources and is vital for prospecting in Asia. Spectral analysis is also widely used in industry; spectral analytical results for industry are published in Zavodskaya Laboratori , a regular publication concerned with such problems.

3. The Soviets are currently producing the following spectroscopic equipment:

OA 2109, OA 2209, OA-2309, types of optical acoustic gas analyzers, about equal in quality to West German or American equivalents, useful only for industrial application.

The phase fluorometer, for luminescence.

The MN 5106, magnetic gas analyzer.

The FK 4501, photo-colorimeter gas analyzer, especially adapted for automation and process control problems.

The DPG-5-52, oxygen analyzer for depolarization.

The IKSL and IKS 14, infrared spectrographs.

4. Soviet publications since 1953 on spectroscopy have emphasized the following subjects:

a. The fact that application of spectral analysis to suitable laboratory problems produces either an appreciable increase in the volume of work a laboratory can handle or permits the same amount of work to be performed by fewer persons. In either event, a substantial saving in trained personnel results.

b. Recent developments in atomic energy physics and chemistry have made imcomplete or useless the application of wet chemical methods. Examples are hafnium, certain rare earth elements, and elements heavier than uranium, all of which have micro-elements accessible only through spectral analysis.

c. Spectral analysis methods are very useful for problems of automation. Soviet efforts in spectral analysis suffer from the same difficulties as those of the Western world: an intense concentration on the application of spectral analytic methods and insufficient attention to basic research in the field.

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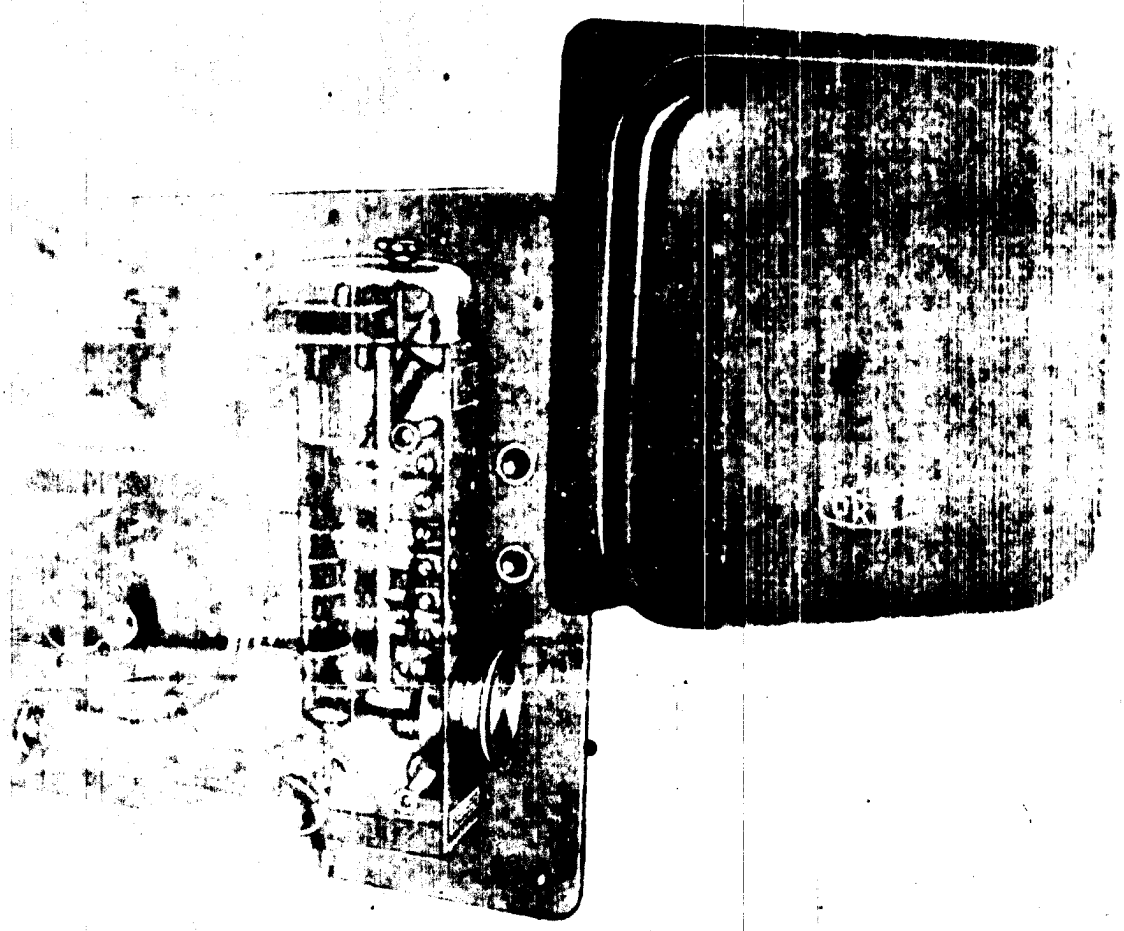


ANALYSEUR D'OXYGENE
POUR DEPOLARISATION

ДПГ-5-52

The type ДПГ-5-52 gas analyser is a stationary electrochemical automatic instrument for continuous determination of the oxygen contents in inflammable or inert gases, also in technological mixtures of organic gases, by measuring the depolarization current.

The presence of electrochemically active gases (chlorine, nitrogen oxides, hydrogen sulphide, etc.) interferes with the determination of the oxygen contents.

The gas to be analysed placed in the absorber of the sensing element is in contact with a solution of sodium sulphate circulating between the absorber and the electrochemical cell. In the solution is thus established an oxygen concentration in equilibrium with the oxygen contents in the gas to be analysed. The electrochemical cell of the instrument has two gold electrodes polarized by a voltage applied. Admitted to the cathode of the cell, the oxygen dissolved in the electrolyte partially depolarizes the electrode, and, as a result, an electrical current flows in the circuit of the sensing element, this current being proportional to the oxygen content in the gas to be analysed.

The complete set of the gas analyser comprises a sensing element, supply unit, secondary instrument, this latter being a 17 mV, type ЭПД electronic potentiometer.

ESSENTIAL SPECIFICATIONS

Scale of the gas analyser	0 to 1% oxygen
Accuracy, to within	±10% of the scale range
Time constant of the instrument	3 min, approx.
Lag in reacting	[illegible] sec
Input gas pressure	500 to 1000 mm·H₂O
Temperature of mix to be analysed	[illegible] + 35° C
Flow of gas to be analysed	14 litres per hour
Ambient air temperature	+10 to 35° C
Relative air humidity	up to 80%
Supply	220 V ±10%, 50 c/s ±1% mains
Energy consumption	110 W

Overall Dimensions and Weight of Complete Set

Instrument Unit	Length mm	Width mm	Height mm	Weight kg
Sensing element	330	160	340	15
Supply unit	275	180	220	8
Secondary instrument, type ЭПД	420	292	506	29

DEPOLARIZATION GAS ANALYSER FOR OXYGEN

DEPOLARISATIONS-GASANALYSATOR ZUM MESSEN DES SAUERSTOFFGEHALTS

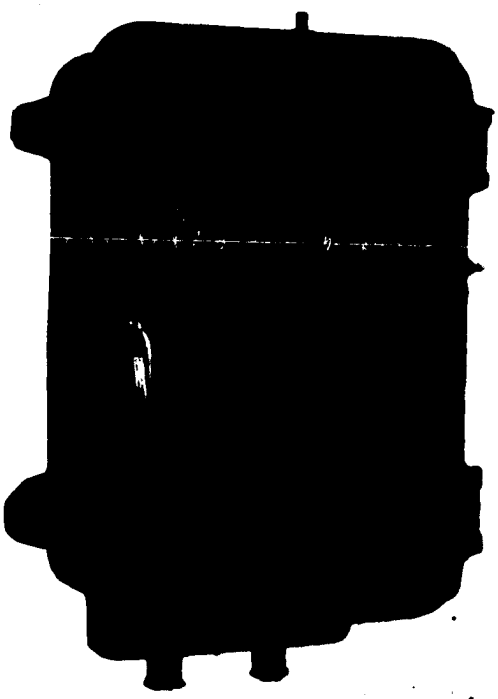
АПГ 5-52

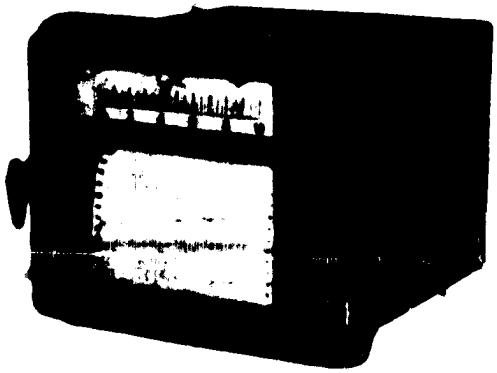
USSR SECTION · BRUSSELS UNIVERSAL AND INTERNATIONAL EXHIBITION 1958

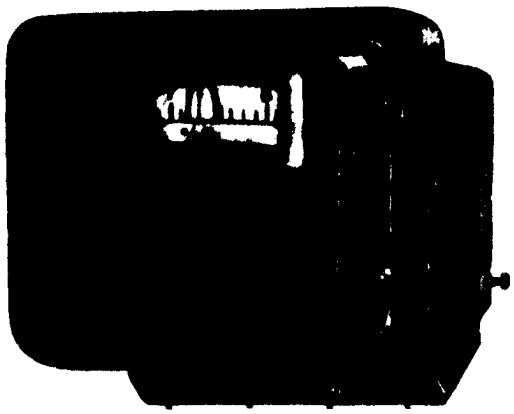
ABTEILUNG DER UdSSR AUF DER ALLGEMEINEN UND INTERNATIONALEN AUSSTELLUNG IN BRÜSSEL 1958

ANALYSEUR MAGNÉTIQUE DE GAZ POUR LA MESURE AUTOMATIQUE DE LA TENEUR EN OXYGENE

MH 5106







ION DE L'URSS A L'EXPOSITION UNIVERSELLE ET INTERNATIONALE
DE BRUXELLES 1958

The model MH 5106 gas analyser is designed to continuously determine the percentage oxygen content of flue gases in boiler installations.

The operating principle of the gas analyser is based on the thermomagnetic convection of the gas under investigation which depends upon the magnetic properties of oxygen.

A compensating arrangement consisting of two bridges (measuring and comparison) is used as the measuring element in this analyser.

The compensating-bridge arrangement ensures high stability of the indications of the instrument.

The MH 5106 gas analyser comprises a flue-gas receiving cell, electronic recorder, electronic indicator for remote duplication of the indications, and auxiliary equipment for cleaning the gas mixture of mechanical and chemically corrosive impurities, and decreasing its humidity.

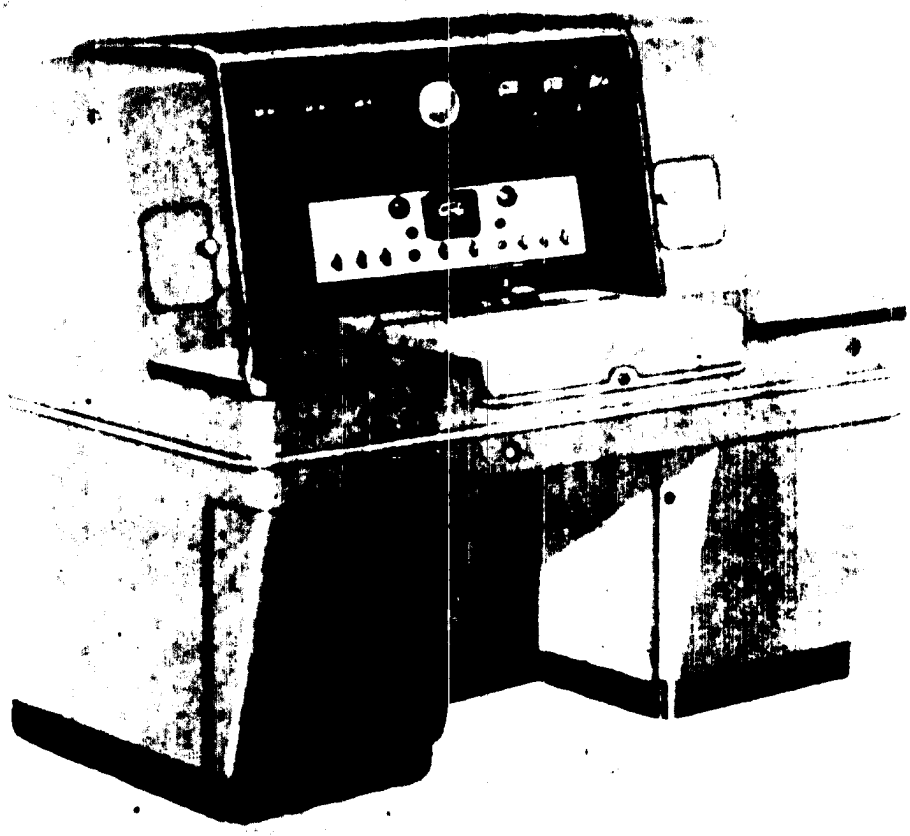
The complete set of auxiliary equipment includes a ceramic filter, cleaning unit, valve with a cross fitting, liquid pressure gauge unit with two control valves and flow indicator, water-jet pump and drain vessel.

The gas analyser is also furnished with a transformer and a voltage stabilizer.

The electronic recorder can be [illegible] at a distance of up to 300 *m* from flue gas receiving cell; the [illegible] indicator — up to 300 *m* from the recorder.

PRINCIPAL CHARACTERISTICS

Range of measurement of oxygen concentration	0-10% (by volume)
Basic accuracy	[illegible]25% (by volume)
Reading lag time	[illegible]ot over 1.5 *min*
Supply voltage	127 [illegible]0 *V* at 50 [illegible]
Power consumption	200 [illegible]
Overall dimensions of gas analyser, *mm*:	
Flue-gas receiving cell	305×520×210
Electronic recorder	287×330×404
Electronic indicator	218×210×210
Weight of gas analyser	100 *kg*



FLUOROMETRE DE PHASE

Fluoromètre est un appareil pour mesurer la durée de la luminescence dont l'extinction dure de 10^{-4} à 10^{-10} sec. Ces limites comprennent la période d'extinction de la luminescence d'une large classe des molécules organiques, des centres de luminescence dans les cristaux, de certains objets biologiques, etc.

L'appareil permet d'examiner les substances en état solide, liquide et gazeux.

Les blocs essentiels du fluoromètre peuvent être aussi employés pour mesurer les intervalles de temps s'écoulant entre deux signaux optiques qui ne sont pas liés à la luminescence.

La mesure de la durée de l'extinction de la luminescence au moyen d'un fluoromètre est fondée sur la détermination du déphasage de la modulation à haute fréquence de la lumière excitant la luminescence, par rapport à la phase de la modulation de la lumière luminescente. La comparaison des phases s'effectue par l'introduction des décalages-étalons de phase dans un des canaux du phasomètre et par la lecture sur l'appareil à aiguille.

Le pouvoir résolvant de l'appareil est de $2 \cdot 10^{-10}$ sec. La sensibilité à la lumière est telle qu'à l'aide de l'appareil on peut mesurer la durée de la luminescence 5–10 milles fois plus faible que l'intensité de luminescence de la fluorescéine.

L'appareil est alimenté du secteur à courant alternatif de 220 volts et du secteur à courant continu de 110 volts.

Encombrement – 1800×700×1200 mm.
Poids – 500 kg.

Pour les conditions des livraisons adressez-vous: «STANKO-[illegible], Moskva, G-200, Smolenskaja-Sennaja ploshchad,

SECTION DE L'URSS À L'EXPOSITION UNIVERSELLE ET INTERNATIONALE DE BRUXELLES 1958

PHASE FLUOROMETER

The phase fluorometer is an instrument intended for the measurement of luminescence duration with an attenuation time ranging about 10^{-8} to 10^{-10} sec. These figures correspond to the limits of the attenuation time for a great variety of organic molecules centres of luminescence in crystals, some biological objects, etc.

The instrument may be applied for the investigation of solid, liquid and gaseous substances.

The main units of the fluorometer may be used for time interval measurements between two light signals of any nature.

Measurement of the luminescence attenuation time is based on the determination of the phase shift between the h.f. modulations of the luminescent and exciting radiations. Comparison of the phases is achieved by introducing some standard phase shifts into one of the phase meter channels and reading the needle indicator.

Resolving power is approximately 2×10^{-11} sec.

Luminous sensitivity is of such value that the apparatus may be used for measurements of radiation with a luminescence duration of 5 to 10 thousand times less than the minimum radiation intensity of fluorescein solution.

The instrument is operated from 220 V a.c. or 110 V d.c. mains.

Overall dimensions – 1500×700×1300 mm.
Weight – 500 kg.

For delivery terms apply to "STANKOIMPORT", Moskva, G-200, Smolenskaja-Sennaja ploshchad, 32/34.

USSR SECTION BRUSSELS UNIVERSAL AND INTERNATIONAL EXHIBITION 1958

PHASEN-FLUOROMETER

Das Phasen-Fluorometer ist ein Gerät für die Messung der Dauer einer Lumineszenz, die während der Zeit von ca. 10^{-8} bis 10^{-10} Sekunden abklingt. In diesem Bereich liegt die Abklingungsdauer der Lumineszenz einer weiten Klasse von organischen Molekeln, von Lumineszenz-Zentren in Kristallen, von einigen biologischen Objekten usw.

Das Gerät ermöglicht die Untersuchung von festen, flüssigen und gasförmigen Stoffen.

Die wichtigsten Teile des Fluorometers können für die Messung der Zeitintervalle zwischen zwei optischen Signalen beliebiger Herkunft verwendet werden.

Die Messung der Abklingungsdauer der Lumineszenz mit Hilfe des Fluorometers beruht auf der Bestimmung der Phasenverschiebung zwischen den Modulationen des Lichtes, die die Lumineszenz erregt, und des Lumineszenzlichtes. Der Vergleich der Phasen erfolgt durch die Einführung von Etalon-Phasenverschiebungen in einem der Phasometer-Kanäle und durch die Ablesung an einem Zeiger-Meßinstrument.

Das Auflösungsvermögen des Geräts nach der Zeit beträgt ca. 2.10^{-11} Sekunden.

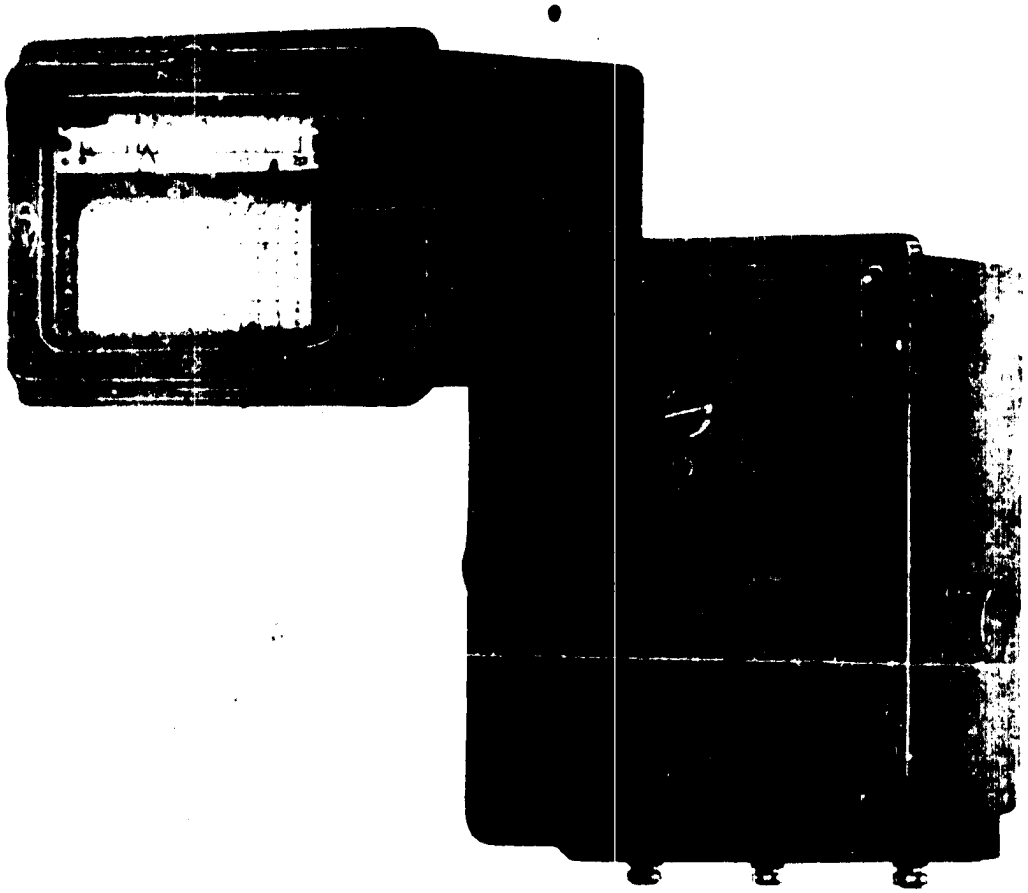
Die Lichtempfindlichkeit des Geräts ist so groß, daß man damit die Messungen der Dauer solcher Lumineszenz ausführen kann, die 5000–10 000 geringer ist, als die Lumineszenz-Intensität von Fluoreszein.

Die Stromversorgung des Geräts erfolgt aus einem Wechselstromnetz 220 V und aus einem Gleichstromnetz 110 V.

Abmessungen – 1500×700×1300 mm. Gewicht – 500 kg.

Alle Lieferungsanfragen sind an „STANKOIMPORT", Moskva, G-200, Smolenskaja-Sennaja Ploschad, 32/34 zu richten.

ABTEILUNG DER UdSSR AUF DER ALLGEMEINEN WELTAUSSTELLUNG IN BRÜSSEL 1958



ANALYSEURS DE GAZ OPTIQUO-ACOUSTIQUES POUR MESURE AUTOMATIQUE DE LA TENEUR EN OXYDE DE CARBONE, EN BIOXYDE DE CARBONE ET EN METHANE

OA 2109
OA 2209
OA 2309

Les analyseurs de gaz optico-acoustiques, automatiques, à poste fixe, types OA 2109, OA 2209 et OA 2309, sont destinés à mesurer et contrôler la teneur en oxyde de carbone (OA 2109), en bioxyde de carbone (OA 2209) ou en méthane (OA 2309), dans des mélanges gazeux contenant de l'oxyde de carbone, du bioxyde de carbone, du méthane, de l'azote, de l'oxygène et de l'hydrogène en quantités quelconques.

Ces appareils peuvent être utilisés pour le contrôle technologique dans les industries metallurgique, chimique, de verre, de ciment et de céramique ainsi qu'en biologie, médecine et dans d'autres domaines.

Le fonctionnement d'un analyseur de gaz optico-acoustique est basé sur la mesure de l'absorption par ce gaz du rayonnement infra-rouge. Le taux d'absorption du rayonnement dépend de la concentration de la composante mesurée dans le mélange gazeux analysé.

Pour effectuer les mesures on utilise dans l'appareil un circuit optique différentiel.

Les analyseurs de gaz comprennent chacun un récepteur dans lequel on effectue la mesure du taux d'absorption du rayonnement infra-rouge par la composante mesurée du mélange analysé et un appareil électronique enregistreur étalonné pour le gaz à la mesure duquel est destiné l'analyseur considéré (CO, CO_2 ou CH_4).

Un stabilisateur de tension est également livré avec les analyseurs de gaz.

Les dispositifs auxiliaires (réfrigérants, filtres, etc.) destinés à l'élimination des impuretés mécaniques et chimiques corrosives du mélange gazeux analysé, à l'abaissement du taux d'humidité de ce mélange, sont livrés avec les analyseurs de gaz conformément aux conditions de leur exploitation.

The OA 2109, OA [illegible] type gas analysers [illegible] percentage [illegible] carbon [illegible] or methane OA [illegible] quantities [illegible] nitrogen [illegible] hydrogen.

The [illegible] branches [illegible] ceramic [illegible] and [illegible] many [illegible]

The [illegible] is based [illegible] gas [illegible] concentration [illegible] mixture.

A [illegible] the [illegible]

[illegible] of [illegible] the gas [illegible] to indicate the [illegible] (CO, CO_2 or CH_4).

The gas ana[illegible]

Auxiliary equ[illegible] etc., used to [illegible] corrosive impurit[illegible] gether with the g[illegible] operation.

PRINCIPALES CARACTERISTIQUES TECHNIQUES

Limites de mesure de la concentration de l'oxyde de carbone, du bioxyde de carbone et du méthane	de 0 à 1, de 0 à 2, de 0 à 5, de 0 à 10, de 0 à 20, de 0 à 30, de 0 à 50, de 0 à 70, et de 0 à 100% en volume
Erreur propre de l'appareil	± 5% de la limite supérieure de mesure
Retard des indications pour un débit de mélange gazeux analysé de 0,3 à 0,7 l/min	égal ou inférieur à 1 min
Tension d'alimentation	127 ± 10 V, fréquence 50 ± 0,5 Hz
Puissance absorbée	250 VA

Ranges of measurem[illegible] concentration by volume	
Basic accuracy	
Reading [illegible]	0.5-0.7 litres per [illegible]
Supply voltage	
Power consumption	

...nary optical-acoustic
...ously determine the
...on dioxide (OA 2209)
...ixture containing any
...de, methane, oxygen,

...ocess control in various
...gical, chemical, glass and
...ation in biology, medicine
...production.

...coustic type gas analyser
...adiation absorbed by a
...ends upon the concen-
...be measured in a gas

...ed as control element of

...cell in which the degree
...articular component of
...nic recorder, calibrated
...nent of the gas mixture

...abilizer.

...w rate boosters,
... and chemically
...are furnished to-
...ith the conditions of

...ISTICS

...0-5, 0-10,
...0-20, ...0, 0-50, 0-70, 0-100%

...5% of full range value

...not over 1 minute

...27 ... 10 V at 50 ... 0.5 c/s

Die ...optisch-akustischen Gasanalysatoren OA 2109, OA 2209 und OA 2309 dienen zum kontinuierlichen Messen der Konzentration von Kohlenmonooxyd (OA 2109), Kohlendioxyd (OA 2209) oder Methan (OA 2309) in Gasgemischen, die Kohlenmonooxyd, Kohlendioxyd, Methan, Stickstoff, Sauerstoff und Wasserstoff in beliebigen Mengen enthalten.

Die Geräte können für technologische Prüfungen in der Hüttenindustrie, in der chemischen, Glas-, Zement- und keramischen Industrie sowie in der Biologie, Heilkunde und auf vielen anderen Gebieten benutzt werden.

Die Wirkungsweise der optisch-akustischen Gasanalysatoren beruht auf der Messung der Absorption von Infrarotstrahlungen durch das Gas. Der Strahlungsabsorptionsgrad hängt von der Konzentration der Meßkomponente in dem zu analysierenden Gasgemisch ab.

Als Meßschema ist in den Geräten das optische Differentialschema angewendet.

Die Gasanalysatoren bestehen aus einem Auffanggefäß, in welchem die Messung des Absorptionsgrades der Infrarotstrahlung durch die Meßkomponente des zu analysierenden Gasgemisches ausgeführt wird, und einem elektronischen Schreibgerät, das für dasjenige Gas geeicht ist, für dessen Messung der Gasanalysator bestimmt ist (CO, CO_2 oder CH_4).

...führt auch ein Spannung

...ler, Filter, Fördermittel usw.), die ...dukt Gasgemisches von angreifenden ...ungen sowie zur Herabsetzung ... zusammen mit den Gasanalysatoren geliefert.

...ISCHE KENNDATEN

...

... 0-1, 0-2, 0-5,
0-10, 0-20, 0-30,
0-50, 0-70, 0-100% volumenge...

... ± 5% vom oberen Grenzmeßwert

...mit einer ...zu analysierenden ... 0,7 MPa ... höchstens 1 Min.

... 127 ± 10 V bei der Frequenz 50 ± 0,5 Hz

... 250 VA

OPTICAL-ACOUSTIC TYPE GAS ANALYSER FOR AUTOMATIC CO, CO_2 AND CH_4 CONTENT DETERMINATION

OPTISCH-AKUSTISCHE GASANALYSATOREN ZUR SELBSTTÄTIGEN BESTIMMUNG VON KOHLENMONOOXYD, KOHLENDIOXYD UND METHAN

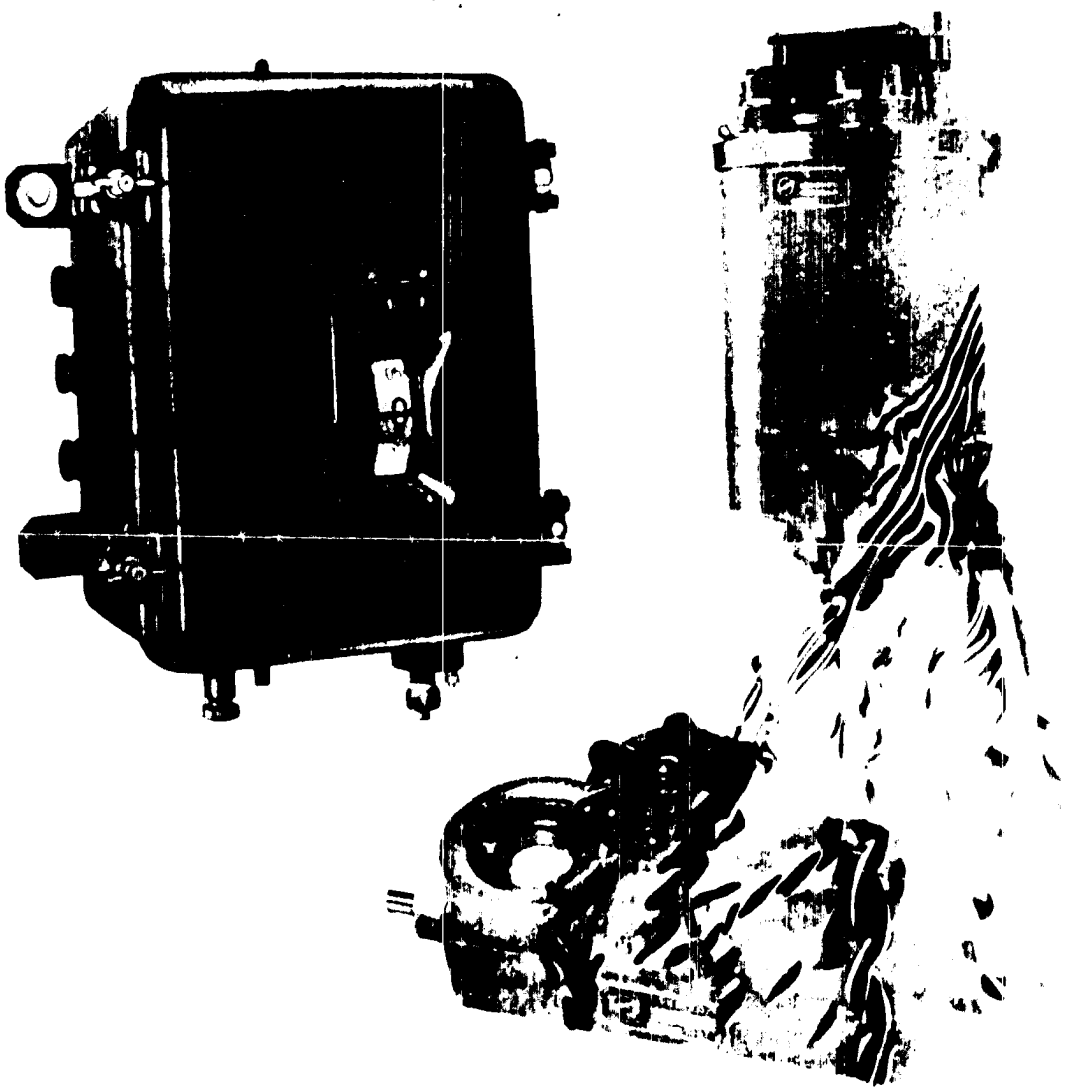
OA 2109

OA 2109

USSR SECTION, BRUSSELS UNIVERSAL AND INTERNATIONAL

ABTEILUNG DER UdSSR AUF DER ALLGEMEINEN WELTAUSSTELLUNG

ANALYSEUR PHOTOCOLORIMETRIQUE DE GAZ POUR LA MESURE AUTOMATIQUE DE LA TENEUR EN BIOXYDE D'AZOTE



ON DE L'URSS A L'EXPOSITION UNIVERSELLE ET INTERNATIONALE
DE BRUXELLES 1958

The model ФК 4501 gas analyser is an automatic instrument designed to determine the NO_2 concentration of atmospheres in closed rooms with concentrations of within limits of 0 to 0.005 mg per litre. The analyser is equipped to signal approach of the NO_2 concentration to a definite, pre-set value.

The operating principle of the analyser is based on the photocolorimetric measurement of the light absorption of a solution which has preliminarily chemically reacted with the nitrogen dioxide contained by the sample of air passed through the working solution.

The light absorption of the solution depends upon the nitrogen dioxide concentration of the sample of air and is determined with the aid of a photocolorimetric circuit by means of a null method with optical compensation of the photoelectric current.

The nitrogen dioxide concentration is measured periodically — every two minutes. The analyser will operate 200 hours without change of the solution.

Reaction of the air to be analysed with the solution and automatic measurement of the lightabsorption of the solution, with the sample air and equal volumes of the working solution periodically fed in the reaction cell, is effected in the receiving cell of the gas analyser.

The working solution is stored in the tank from which it is fed to the receiving cell by a gear pump.

The waste solution is returned to the tank and subjected to cleaning for removal of the coloured compounds.

The complete set of the instrument also includes a regulating and filtering unit which serves for cleaning the sample air of mechanical impurities and for regulating the rate of flow through the receiving cell.

The auxiliary equipment, hoses, connecting branches, valves, etc., are furnished together with the analyser in accordance with the conditions of operation.

PRINCIPAL TECHNICAL DATA

Limits of NO_2 concentration measured	0-0.005 *mg per litre*
Basic accuracy	0.00025 *mg per litre*
Starting time of the analyser	5-10 *minutes*
Reading lag time, not over	5 *minutes*
Supply voltage	127 *V* ± 10% at 50 *c/s*
Power consumption	100 *VA*
Overall dimensions, mm:	
Receiving cell	405×306×170
Tank	398×196×167
Regulating	[illegible]

PHOTOCOLORIMETRIC TYPE GAS ANALYSER FOR AUTOMATIC NO_2 - CONTENT DETERMINATION

ФК 4501

FOTOKOLORIMETRISCHER GASANALYSATOR ZUR SELBSTTÄTIGEN STICKSTOFFDIOXYDBESTIMMUNG

ФК 4501